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## TECHNICAL NOTES

of the

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## ALASKA FOREST RESEARCH CENTER

U. S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE

No. 49

JUNEAU, ALASKA

### CUBIC-FOOT VOLUME TABLES FOR PAPER BIRCH IN ALASKA

The four cubic-foot tree volume tables for paper birch (Betula Papyrifera Marsh.) in this report are based on 340 tree measurements distributed from the Yukon River south to the Kenai Peninsula, and from the Alaska-Canada border west to McGrath. The volume tables were prepared by the combined variable method. <sup>1/</sup>

Individual tree volumes were computed graphically. Independent variables were diameter at breast height (D), and total tree height (H).

The relationship of total volume to the combined independent variable ( $D^2H$ ) was linear throughout most of the range of  $D^2H$  with a slight curvature in the lower range. A least squares solution was used to balance the linear part of the regression; the curved part was balanced freehand.

The merchantable volumes, expressed as a percent of total volume, were plotted over  $D^2H$ . These curves, balanced freehand, were then used to adjust total volume to merchantable volume.

The tables appear suitable for regional use. Little variation was observed in groups of sample trees from different parts of the region. For instance, the difference in aggregate deviation between trees north and south of the Alaska Range was negligible. Open grown trees, however, were found to vary considerably in volume from forest grown trees due to differences in form. Trees growing in an open situation or in very sparse stands will consistently have less volume than given in these tables.

Particular caution is advised when using these tables to estimate volume in trees over 13 inches d.b.h. because there were few data in the larger diameter classes.

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<sup>1/</sup> Spurr, Stephen H. Forest Inventory. The Ronald Press Co., New York. 476 pp. 1952.

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ROCKY MOUNTAIN STATION

PAPER BIRCH (*Betula papyrifera* Marsh.)

TOTAL VOLUME, I. B.

D.B.H.	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	Basis
Inches	Cubic feet																No. of trees
1	0.04	0.08	0.10	0.11													—
2		0.22	0.27	0.31	0.37	0.40											5
3			0.52	0.65	0.75	0.85	0.95	1.5									16
4			0.95	1.1	1.3	1.5	1.6	1.8	2.0	2.2							15
5				1.7	2.0	2.3	2.5	2.8	3.1	3.4	3.6	3.9					21
6				2.5	2.9	3.3	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.4			22
7				3.3	3.9	4.4	4.9	5.5	6.0	6.5	7.1	7.6	8.1	8.6			46
8						5.7	6.4	7.2	7.8	8.4	9.1	9.7	10.4	11.0	11.7		42
9						7.2	8.0	8.9	9.7	10.5	11.3	12.1	13.0	13.8	14.6	15.4	42
10						8.8	9.8	10.8	11.8	12.8	13.8	14.8	15.8	16.8	17.9	18.9	48
11						10.5	11.7	12.9	14.1	15.4	16.6	17.8	19.0	20.2	21.4	22.7	37
12							13.8	15.2	16.7	18.1	19.6	21.0	22.5	24.0	25.4	26.9	25
13							16.0	17.8	19.5	21.2	22.9	24.6	26.3	28.0	29.7	31.4	13
14								20.5	22.5	24.4	26.4	28.4	30.4	32.4	34.3	36.3	4
15								23.4	25.7	28.0	30.2	32.5	34.8	37.0	39.3	41.6	3
16								29.1	31.7	34.3	36.9	39.5	42.0	44.6	47.2		1
17									35.7	38.6	41.6	44.5	47.4	50.3	53.2		—
18									40.0	43.2	46.5	49.8	53.0	56.3	59.6		—

Standard error of estimate = 9.68 percent.

Aggregate deviation = 0.12 percent.

Basis of table: 340 trees

Volumes above dashed line computed by combined variable method with graphical solution.

Volumes below dashed line computed by combined variable method with least squares solution giving formula:  $V = 0.202 X + 0.69$  where  $V$  = volume and  $X = D^2H/100$ .

Range of data enclosed by solid line.

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PAPER BIRCH (*Betula papyrifera* Marsh.)

MERCHANTABLE VOLUME, I. B.

1-FOOT STUMP, 4-INCH TOP

D.B.H.	30	35	40	45	50	55	60	65	70	75	80	85	90	Basis
Inches	Cubic feet													No. of trees
5	0.46	.70	.88	1.1	1.3	1.7	2.0	2.2	2.6					18
6	1.1	1.5	1.8	2.2	2.7	3.2	3.6	4.0	4.4	4.7	5.2			22
7	1.9	2.5	3.2	3.6	4.2	4.7	5.3	5.9	6.4	6.9	7.4			46
8			4.5	5.1	6.0	6.6	7.2	7.9	8.5	9.2	9.8	10.5		42
9			6.0	6.8	7.7	8.5	9.3	10.2	10.9	11.8	12.6	13.3	14.0	42
10			7.6	8.6	9.6	10.6	11.6	12.6	13.5	14.5	15.4	16.5	17.4	48
11			9.3	10.5	11.7	12.8	14.0	15.3	16.4	17.5	18.8	19.9	21.1	37
12				12.6	13.8	15.4	16.6	18.0	19.5	20.9	22.3	23.6	25.0	25
13				14.7	16.4	17.9	19.7	21.3	22.9	24.4	26.0	27.9	29.5	13
14					19.1	20.9	22.7	24.6	26.4	28.6	30.4	32.2	34.1	4
15					21.8	23.9	26.0	28.4	30.6	32.7	34.8	36.9	39.1	3
16						27.4	29.8	32.2	34.7	37.1	39.5	41.9	44.4	1
17							33.6	36.3	39.1	41.8	44.6	47.3	50.0	—
18							37.6	40.6	43.7	46.8	49.8	52.9	56.6	—

Aggregate deviation = 0.31 percent.

Basis of table = 301 trees.

Merchantable volumes computed as percent of total volume. Percent adjustment based on free hand curve of percent merchantable over  $D^2H/100$ .

Range of data enclosed by solid line.

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PAPER BIRCH (*Betula papyrifera* Marsh.)

MERCHANTABLE VOLUME, I. B. 1-FOOT STUMP, 6-INCH TOP

D.B.H.	TOTAL HEIGHT (FEET)											Basis
	45	45	50	55	60	65	70	75	80	85	90	
Inches	Cubic feet											No. of trees
7	0.18	.66	1.2	2.0	2.4	3.0	3.6	4.3	4.9			40
8	1.6	2.3	3.2	3.8	4.6	5.6	6.3	7.1	7.8	8.5		42
9	3.2	4.1	5.2	6.3	7.2	8.1	9.1	10.0	10.8	11.7	12.5	42
10	5.2	6.4	7.6	8.7	9.7	10.8	11.8	12.8	13.9	15.0	16.1	48
11	7.2	8.5	9.8	11.1	12.5	13.6	15.0	16.2	17.4	18.6	20.0	37
12		10.8	12.3	13.7	15.6	16.7	18.3	19.8	21.1	22.6	24.2	25
13		13.1	15.0	16.6	18.4	20.2	21.9	23.4	25.5	26.7	28.6	13
14			17.6	19.8	21.7	23.5	25.8	27.4	29.5	31.2	33.0	4
15			20.6	22.9	25.2	27.2	29.6	31.7	33.7	35.8	38.3	3
16				26.2	28.8	31.2	33.6	36.3	38.6	41.0	43.4	1
17					32.5	35.1	38.3	40.9	43.6	46.3	48.9	—
18					36.8	39.7	42.8	45.8	48.8	51.8	54.8	—

Aggregate deviation = 0.34 percent.

Basis of table = 255 trees.

Merchantable volumes computed as percent of total volume. Percent adjustment based on freehand curve of percent merchantable over  $D^2H/100$ .

Range of data enclosed by solid line.

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PAPER BIRCH (*Betula papyrifera* Marsh.)

MERCHANTABLE VOLUME, I. B. 2-FOOT STUMP, 8-INCH TOP

D.B.H.	TOTAL HEIGHT (FEET)											Basis
	40	45	50	55	60	65	70	75	80	85	90	
Inches	Cubic feet											No. of trees
10	0.1	1.1	2.0	3.1	4.1	5.2	6.4	7.6	8.9	10.0	11.3	48
11	1.7	2.9	4.1	5.6	7.1	8.6	10.0	11.4	12.9	14.1	15.7	37
12		5.2	6.8	8.7	10.3	12.2	13.6	15.3	16.6	18.3	19.9	25
13		7.8	10.0	11.9	13.8	15.8	17.5	18.9	21.0	22.3	24.2	13
14			13.1	15.3	17.3	19.0	21.3	22.8	24.9	26.8	28.7	4
15			16.1	18.5	21.0	22.6	25.0	27.1	29.6	31.4	33.7	3
16				21.8	24.4	26.8	29.2	31.6	34.0	36.6	38.7	1
17					27.8	30.9	33.7	36.5	38.9	41.2	43.6	—
18					32.4	35.0	38.1	40.8	43.5	46.7	49.5	—

Aggregate deviation = 0.58 percent.

Basis of table = 151 trees.

Merchantable volumes computed as percent of total volume. Percent adjustment based on freehand curve of percent merchantable over  $D^2H/100$ .

Range of data enclosed by solid line.

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